## Addendum

# DF1 Protocol Mode for Anybus® Communicator™

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**Rev. 1.00**


**HMS Industrial Networks AB**

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# Important User Information

This document contains a general introduction as well as a description of the technical features provided by the Anybus Communicator, including the PC-based configuration software.

The reader of this document is expected to be familiar with PLC and software design, as well as communication systems in general. The reader is also expected to be familiar with the Microsoft Windows operating system.

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## Trademark Acknowledgements

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| | |
|---|---|
| **Warning**: | This is a class A product. in a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. |
| **ESD Note**: | This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product. |

DF1 protocol mode for Anybus Communicator Addendum
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# About This Document

This document only covers the DF1 protocol mode in the Anybus Communicator. Please refer to the respective ABC fieldbus manuals for information on the master and generic modes, that also are available for all ABC modules.

For more information, documentation etc., please visit the HMS website, 'www.anybus.com'.

# Related Documents

| Document | Author |
|---|---|
| ABC-DF1 Installation Leaflet | HMS |
| DF1 Protocol and Command Set - Reference Manual, 1770-6.5.16, October 1996 | Allen-Bradley |
| | |
| | |
| | |

# Document History

### Summary of Recent Changes ( ... 1.00)

| Change | Page(s) |
|---|---|
| - | - |
| - | - |
| - | - |
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### Revision List

| Revision | Date | Author(s) | Chapter(s) | Description |
|---|---|---|---|---|
| 1.00 | 2010-05-31 | KeL | All | First official release |
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# Conventions & Terminology

The following conventions are used throughout this document:

- Numbered lists provide sequential steps
- Bulleted lists provide information, not procedural steps
- The term 'user' refers to the person or persons responsible for installing the Anybus Communicator in a network.
- The term 'gateway' refers to the Anybus Communicator.
- Hexadecimal values are written in the format 0xNNNN or NNNNh, where NNNN is the hexadecimal value.
- Decimal values are represented as NNNN where NNNN is the decimal value
- As in all communication systems, the terms "input" and "output" can be ambiguous, because their meaning depend on which end of the link is being referenced. The convention in this document is that "input" and "output" are always being referenced to the master/scanner end of the link.

# Glossary

| Term | Meaning |
|---|---|
| ABC | Anybus® Communicator™ |
| Command | A pre-defined transaction. |
| Configuration | List of configured nodes with transactions on the subnetwork. |
| Fieldbus | The higher level network to which the communicator is connected. |
| Fieldbus Control System | Fieldbus master |
| Monitor | A tool for debugging the gateway and the network connections. |
| Node | A device in the configuration which defines the communication with a node on the subnetwork |
| Subnetwork | The network that is logically located on a subsidiary level with respect to the fieldbus, and to which the Anybus Communicator acts as a gateway. |
| Transaction | A generic building block that is used in the subnetwork configuration and defines the data that is sent and received on the subnetwork. |
| User | Person or persons responsible for installing the Anybus Communicator |
| Higher Level Network | Master node fieldbus network. Please refer to the relevant ABC manual. |
| Network | |
| Fieldbus | |

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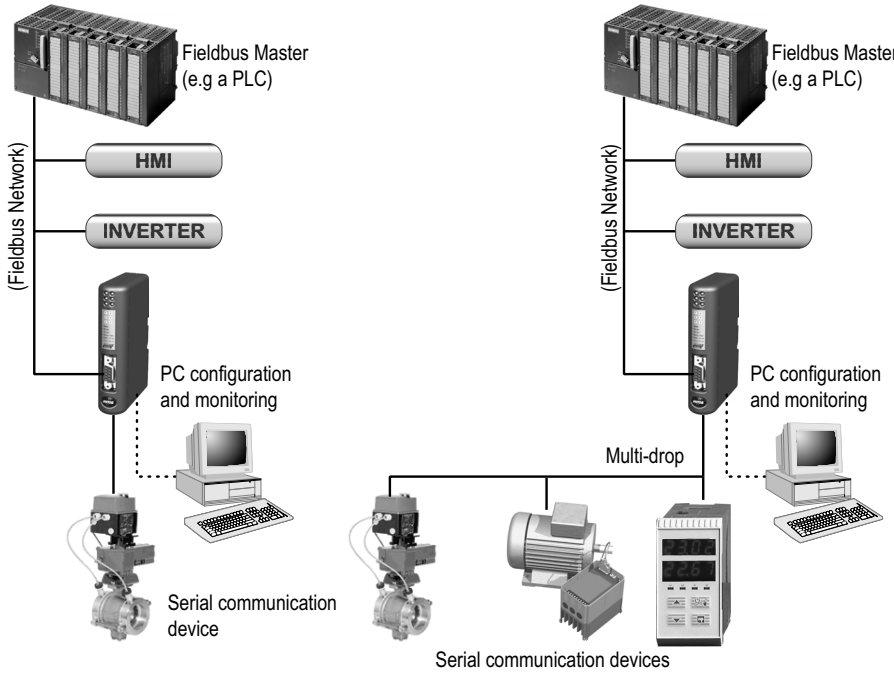
# 1. About the Anybus Communicator for DF1

The Anybus Communicator for DF1 acts as a gateway between the serial DF1 protocol and a number of fieldbuses[1]. Integration of industrial devices is enabled without loss of functionality, control and reliability, both when retro-fitting to existing equipment as well as when setting up new installations.




**Single-Node DF1 Serial Sub Network** **Multi-Node DF1 Serial Sub Network**

### Subnetwork

The gateway can address up to 50 nodes, with node addresses in the span 0-254. The upper limit of 50 nodes is due to the maximum number of transactions that are allowed in one configuration. The gateway supports the following physical standards:

- RS-232
- RS-422
- RS-485

### DF1 Interface

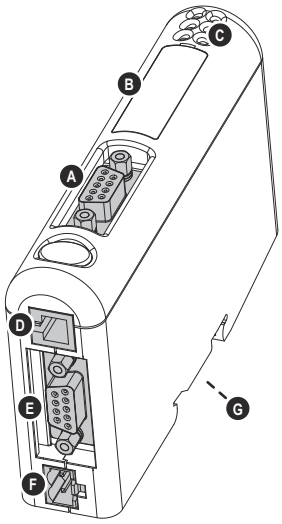
DF1 connectivity is provided through patented Anybus technology; a proven industrial communication solution used all over the world by leading manufacturers of industrial automation products.

- Galvanically isolated bus interface
- RS-232, RS-422 or RS-485 operation
- On-board configuration switches
- 2400... 38400 bps operation

1. At the moment the following fieldbuses are supported: Profibus-DP, Interbus-S, CANopen, DeviceNet, EtherCAT, EtherNet/IP, Profinet IO, FIPIO, Modbus Plus, Modbus RTU, ControlNet, and Modbus TCP. For fieldbus specific settings, please refer to the respective Anybus Communicator manuals, available for download at www.anybus.com.

# 1.1 External View

For wiring and pin assignments, see A-43 “Connector Pin Assignments”.




**A: Fieldbus Connector**

This connector is used to connect the gateway to the fieldbus. It may differ depending on fieldbus. Please refer to the ABC manual for the fieldbus that will be used.

See also...

- “Fieldbus Connector” on page 43

**B: Configuration Switches**

See also...

- “Configuration Switches” on page 6

**C: Status LEDs**

See also...

- “Status LEDs” on page 6

**D: PC-connector**

This connector is used to connect the gateway to a PC for configuration and monitoring purposes.

See also...

- “PC Connector” on page 44

**E: DF1 Subnetwork Connector**

This connector is used to connect the gateway to the serial DF1 subnetwork.

See also...

- “Subnetwork Interface” on page 45

**F: Power Connector**

This connector is used to apply power to the gateway.

See also...

- “Power Connector” on page 43
- “Technical Specification” on page 47

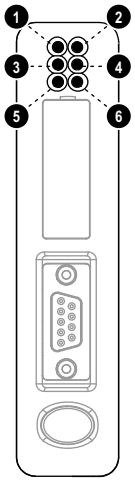
**G: DIN-rail Connector**

The DIN-rail mechanism connects the gateway to PE (Protective Earth).

See also...

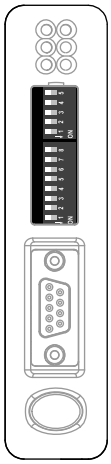
- “Hardware Installation” on page 7
- “Technical Specification” on page 47

## 1.2 Status LEDs




| # | State | Status |
|---|---|---|
| 1 | The behavior of LEDs 1 - 4 is fieldbus specific. Please refer to the respective ABC fieldbus manuals for details. | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 - Subnet Status | Off | Power off |
| | Green, flashing | Running correctly, but one or more transaction error(s) have occurred |
| | Green | Running |
| | Red | Transaction error/timeout or subnet stopped |
| 6 - Device Status | Off | Power off |
| | Alternating Red/Green | Invalid or missing configuration |
| | Green | Initializing |
| | Green, flashing | Running |
| | Red, flashing | Contact the HMS support department |

## 1.3 Configuration Switches



The configuration switches determines the basic communication settings for the fieldbus interface.[1] Normally, these switches are covered by a plastic hatch. When removing the hatch, avoid touching the circuit boards and components. If tools are used to open the hatch, be cautious.

Note that these settings cannot be changed during runtime, i.e. the gateway must be restarted in order for any changes to have effect.

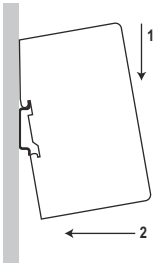
Please refer to the respective ABC fieldbus manuals for information about the settings of these switches.

1. Depending on which ABC module you use, the switches may look different. Please refer to the respective fieldbus manual for information.

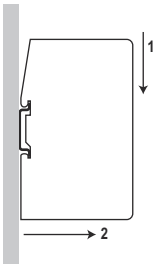
# 1.4 Hardware Installation

Perform the following steps when physically installing the gateway:

1. Snap the gateway on to the DIN-rail (See 1-5 "DIN-rail Connector")
   The DIN-rail mechanism works as follows:




To snap the gateway *on*, first press the it downwards (1) to compress the spring in the DIN-rail mechanism, then push it against the DIN-rail as to make it snap on (2)




To snap the gateway *off*, push the it downwards (1) and pull it out from the DIN-rail (2), as to make it snap off from the DIN-rail.

2. Connect the gateway to the fieldbus network
3. Set the fieldbus communication settings using the on-board switches
4. Connect the gateway to the serial subnetwork
5. Connect the gateway to a free COM-port on the PC via the PC-cable.
6. Connect the power cable and apply power
7. Start the ABC Config Tool program on the PC
   (The ABC Config Tool software attempts to detect the serial port automatically. If not successful, select the correct port manually in the "Port"-menu).
8. Configure the gateway using the ABC Config Tool and download the configuration

# 1.5 Software Installation

## 1.5.1 ABC Config Tool

### System requirements

- Pentium 133 MHz or higher
- 10 MB of free space on the hard drive
- 8 MB RAM
- Screen resolution of 800x600 (16 bit colour) or higher
- Microsoft Windows™ 2000 / XP / Vista / 7
- Internet Explorer 4.01 SP1 or newer

### Installation

- **Anybus Communicator resource CD**

  Insert the CD and follow the on-screen instructions. If the installation does not start automatically, right-click on the CD-drive icon and select Explore. Execute 'setup.exe' and follow the on-screen instructions.

- **From website**

  Download and execute the self-extracting .exe-file from the HMS website (www.anybus.com).

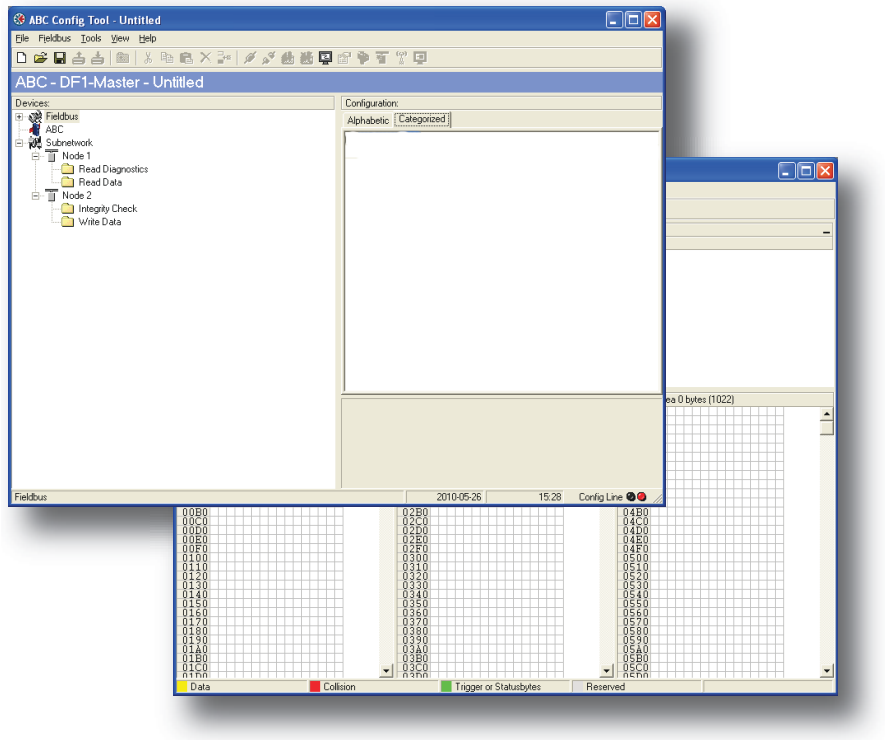
# 2. Basic Operation

## 2.1 General

The Anybus Communicator gateway is designed to exchange data between a serial subnetwork and a higher level network. Unlike most other gateway devices of similar kind, most ABC gateways do not have a fixed protocol for the subnetwork, and can be configured to handle almost any form of serial communication. In this document, the DF1 protocol mode for the subnetwork is described. When configuring the ABC module you can also choose either master mode or generic mode. For information and instructions on this modes, please refer to the respective ABC fieldbus manuals.

The gateway can issue serial telegrams cyclically, on change of state, or based on trigger events issued by the control system of the higher level network (i.e. the fieldbus master or PLC). It can also monitor certain aspects of the subnetwork communication and notify the higher level network when data has changed.

An essential part of the Anybus Communicator package is the ABC Config Tool, a Windows™ application which is used to supply the gateway with a description of the subnetwork protocol. No programming skills are required; instead, a visual protocol description-system is used to specify the different parts of the serial communication.

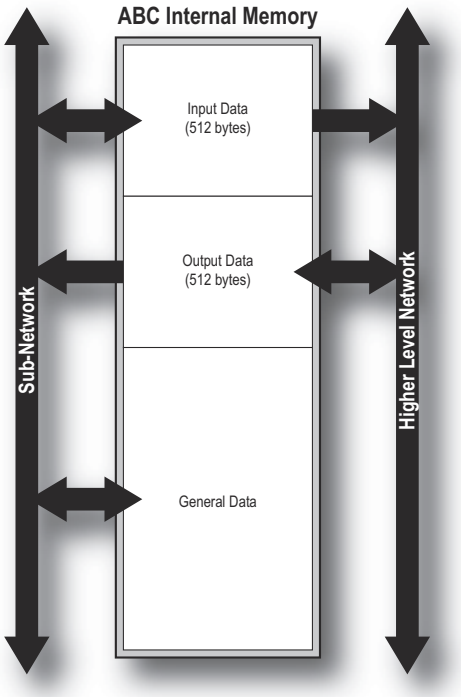


# 2.2 Data Exchange Model

Internally, the data exchanged on the subnetwork, and the data exchanged on the higher level network, resides in the same memory.

This means that in order to exchange data with the subnetwork, the higher level network simply reads and writes data to memory locations specified using the ABC Config Tool. The very same memory locations can then be exchanged on the subnetwork.

The internal memory buffer is divided into three areas based on their function:




- **Input Data (512 bytes)**

  This area can be read by the higher level network.

- **Output Data (512 bytes)**

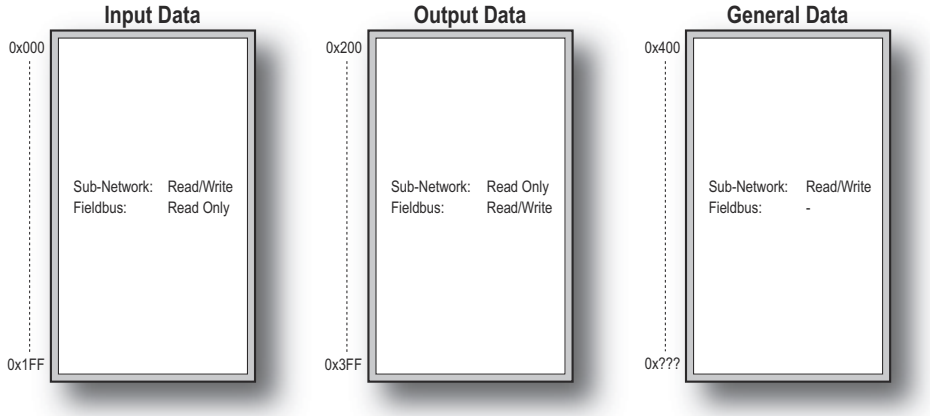
  This area can be read/written by the higher level network.

- **General Data (Up to 1024 bytes)**

  This area cannot be accessed from the higher level network, but may be used for transfers between individual nodes on the subnetwork, or as a general "scratch pad" for data. The actual size of this area depends on the amount of data that is exchanged on the subnetwork. The gateway can handle up to 1024 bytes of General Data.

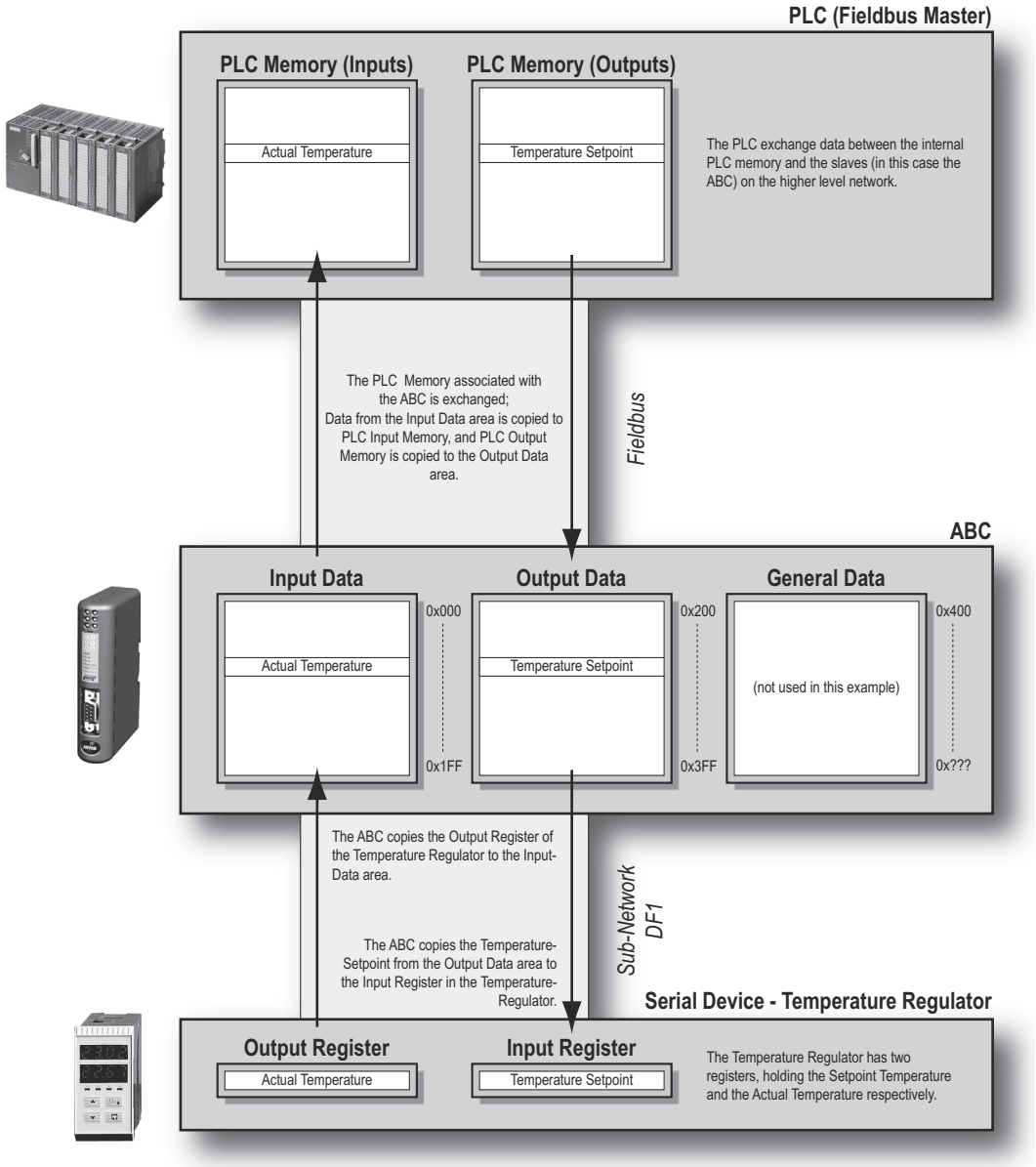
## 2.2.1 Memory Map

When building the subnetwork configuration using the ABC Config Tool, the different areas described above are mapped to the memory locations (addresses) specified below.



## 2.2.2 Data Exchange Example

In the following example, a temperature regulator on the subnetwork exchanges information with a PLC on the higher level network, via the internal memory buffers in the gateway.


PLC (Fieldbus Master)
PLC Memory (Inputs)
PLC Memory (Outputs)
Actual Temperature
Temperature Setpoint
The PLC exchange data between the internal PLC memory and the slaves (in this case the ABC) on the higher level network.
The PLC Memory associated with the ABC is exchanged; Data from the Input Data area is copied to PLC Input Memory, and PLC Output Memory is copied to the Output Data area.
Fieldbus
ABC
Input Data
Output Data
General Data
0x000
0x1FF
0x200
0x3FF
0x400
0x???
Actual Temperature
Temperature Setpoint
(not used in this example)
The ABC copies the Output Register of the Temperature Regulator to the Input-Data area.
The ABC copies the Temperature-Setpoint from the Output Data area to the Input Register in the Temperature-Regulator.
Sub-Network DF1
Serial Device - Temperature Regulator
Output Register
Input Register
Actual Temperature
Temperature Setpoint
The Temperature Regulator has two registers, holding the Setpoint Temperature and the Actual Temperature respectively.

# 2.3 Subnetwork Protocol

## 2.3.1 Protocol Modes

The gateway features three distinct modes of operation regarding the subnetwork communication, 'Master Mode', 'Generic Data Mode', and 'DF1 Master Mode'. This document only covers the 'DF1 Master Mode'. For information and instructions on the other modes, please refer to the respective ABC fieldbus manuals.

- **DF1 Master Mode**

  The gateway acts as a master on the subnetwork, and the serial communication takes place in a Query-Response fashion. The nodes on the network are not permitted to issue messages unless they have been addressed by the gateway first.

  For more information about this mode, see "DF1 Master Mode" on page 13.

## 2.3.2 Protocol Building Blocks

The following building blocks are used in ABC Config Tool to describe the subnetwork communication. How these blocks apply to the DF1 Master Mode will be described later in this document.

- **Nodes**

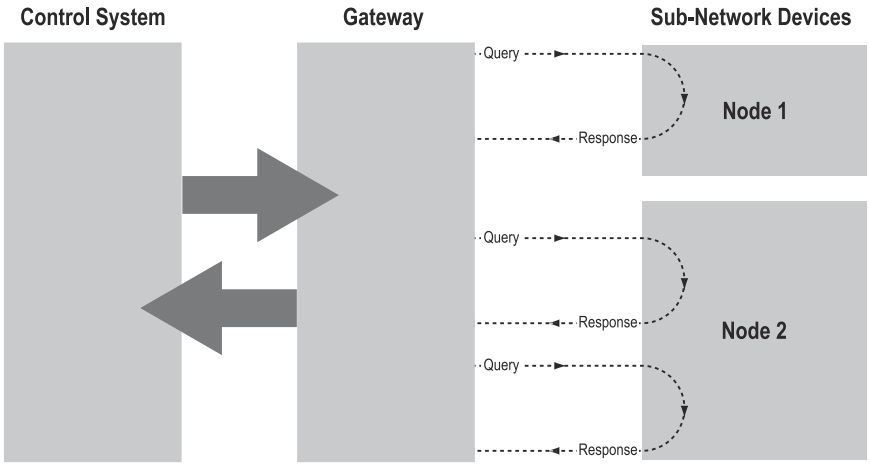
  A node represents a single device on the subnetwork. Each node can be associated with a number of services, see below.

- **Services**

  A 'service' represents a set of commands and operations on the subnetwork, that is pre-defined in the ABC DF1 module. Each service is associated with a set of parameters controlling how and when to use it on the subnetwork.

### 2.3.3 DF1 Master Mode

The communication is based on a Query/Response scheme; where the gateway issues a Query on the subnetwork. The addressed node is expected to issue a Response to that Query. Nodes are not permitted to issue Responses spontaneously, i.e. without first receiving a Query.

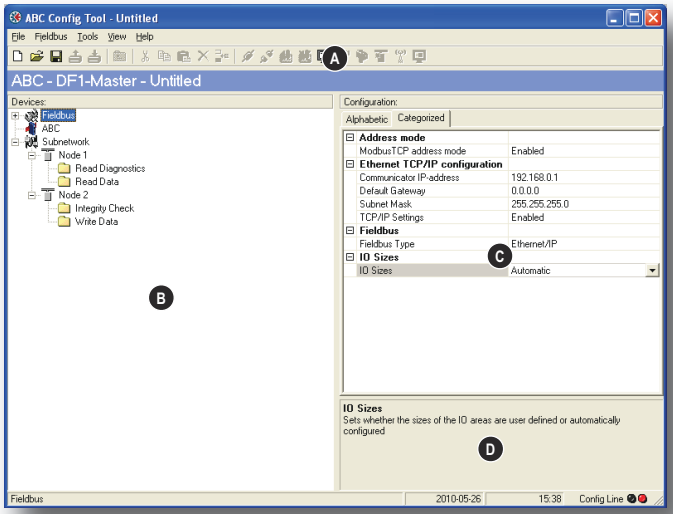



In DF1 Master Mode, ABC Config Tool comes pre-loaded with a number of services, that can be selected by the user. The actual DF1 commands, that perform the services during runtime, are pre-defined in the ABC. The configuration of the services is performed by right-clicking on a node the ABC Config Tool and selecting 'Add Command'.

# 3. Navigating the ABC Config Tool

## 3.1 Main Window

The main window in the ABC Config Tool can be divided in 4 sections as follows:




- **A: Pull-down Menus & Tool Bar**

  The second drop-down menu from the left will change depending on the current context. The Tool Bar provides quick access to the most frequently used functions.

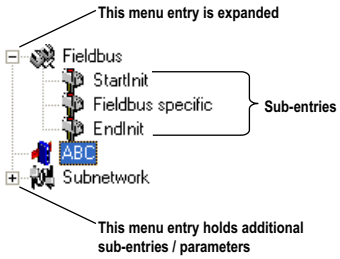
- **B: Navigation Section**

  This section is the main tool for selecting and altering different levels of the subnetwork configuration.

  Entries preceded by a '+' holds further configuration parameters or 'sub menus'. To gain access to these parameters, the entry must be expanded by clicking '+'.

  There are three main levels in the navigation window, namely Fieldbus, ABC and Subnetwork.

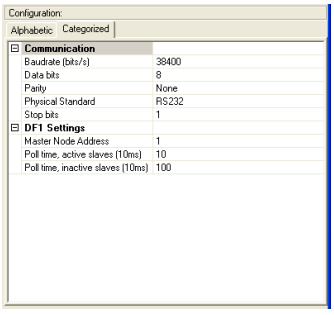
  Right-clicking on entries in this section brings out additional selections related to that particular entry.




- **C: Parameter Section**

  This section holds a list of parameters or options related to the currently selected entry in the Navigation Section.

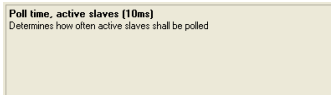
  The parameter value may be specified either using a selection box or manually, depending on the parameter itself. Values can be specified in decimal form (e.g. '42'), or in hexadecimal format (e.g. '0x2A').




**Parameter Section**

- **D: Information Section**

  This section holds information related to the currently selected parameter.

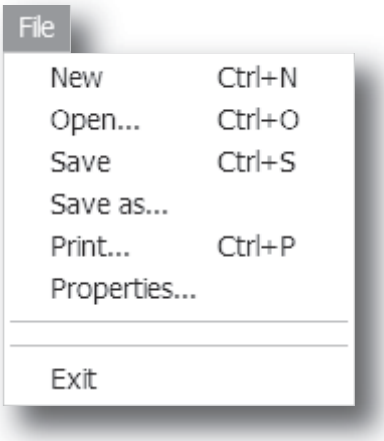



**Information Section**

## 3.1.1 Pull-down Menu

### File

This menu features the following entries:




- **New**
  Create a new configuration.
- **Open...**
  Open a previously created configuration.
- **Save**
  Save the current configuration.
- **Save As...**
  Save the current configuration under a new name.
- **Print...**
  Send details about the current configuration to a printer.
- **Properties...**
  This brings out the following window:

Name the Configuration
Select a Name for the Configuration
Untitled
Enable password
Please save the password in a secure location. The password is required to modify or download a new configuration to the module. If you forget the password the module must be returned to the factory to be reset.
Download Password (6)
Upload Password (6)
OK
Cancel

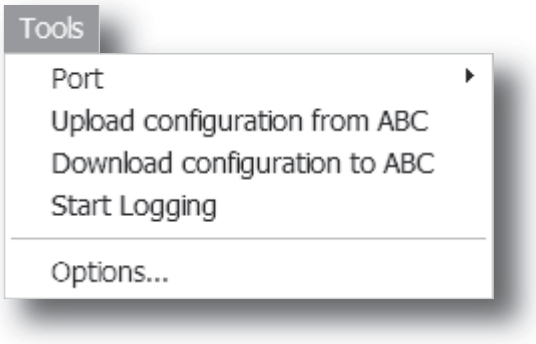
| Item | Description |
|---|---|
| Select a Name for the Configuration | A name for the configuration may be entered here |
| Download Password(6) | These fields can be used to password-protect the configuration in the gateway. |
| Upload Password(6) | |

**CAUTION:** Always keep a copy of the password in a safe place. A lost password cannot be retrieved!

- **Exit**
  Close the ABC Config Tool.

## Tools

This menu features the following entries:




- **Port**

  This entry selects the COM-port used for the configuration of the gateway.

- **Upload configuration from ABC**

  Upload the configuration from the gateway to the ABC Config Tool.

- **Download configuration to ABC**

  Download the current configuration into the gateway.

- **Start Logging**

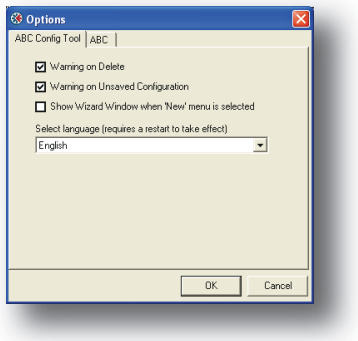
  Start the Data Logger (see 9-35 “Data Logger”).

  Note that when the Data Logger is active, this menu-entry is changed to ‘Stop Logging’.

- **Options**

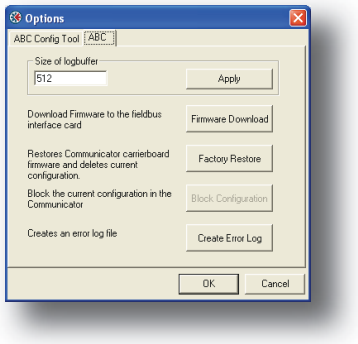
  This will bring out the following window:

| Item | Description |
|---|---|
| Warning on Delete | A confirmation dialog is displayed each time something is deleted. |
| Warning on unsaved data | A confirmation dialog is displayed when closing the ABC Config Tool with unsaved data. |
| Show Wizard when “New” menu is selected | The Wizard is displayed each time a new configuration is created. |
| Select language (requires a restart to take effect) | Selects which language to use. The new setting will be active the next time the program is launched. |



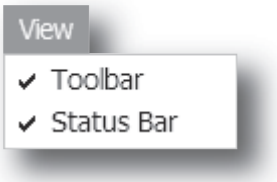

Selecting the ‘ABC’-tab will reveal additional properties:

| Item | Description |
|---|---|
| Size of logbuffer | By default, the Data Logger can log up to 512 entries in each direction. If necessary, it is possible to specify a different number of entries (valid settings range from 1...512). Cick ‘Apply’ to validate the new settings. See also 9-35 “Data Logger”. |
| Firmware Download | Download firmware to the embedded fieldbus interface. **Warning: Use with caution.** |
| Factory Restore | Restores the gateway firmware to it’s original state (does not affect the embedded fieldbus interface). |
| Block Configuration | When selected, the downloaded configuration will not be executed by the gateway. **Warning: Use with caution.** |
| Create Error log | Creates an error log file |



### View

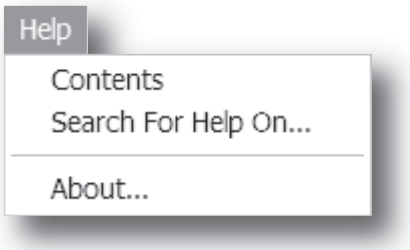
This menu features the following entries:




- **Toolbar**
  This entry enables/disables the toolbar icons at the top of the main window.
- **Status Bar**
  This entry enables/disables the status bar at the bottom of the main window.

### Help

This menu features the following entries:




- **Contents**
  No on-line help system exists.[1]
- **Search For Help On...**
  no on-line help system exists.[1]
- **About...**
  Display general information about the gateway and the current build of ABC Config Tool.

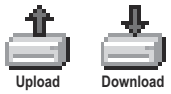
1. Please contact www.anybus.com if you have any questions concerning the ABC Config Tool

## 3.1.2 Toolbar Icons

The toolbar features icons for the most commonly used functions.

- **New, Open & Save**
  See "File" on page 15.

- **Upload from ABC & Download to ABC**
  See "Tools" on page 16.



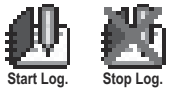

- **Up one Level**
  Clicking on this icon will move the selection in the navigation section.

- **Cut, Copy, Paste, Delete, Insert**
  These icons are used for common editing functions in the navigation section.

- **Connect**
  Clicking on this icon will cause the ABC Config Tool to attempt to connect to the gateway.

- **Disconnect**
  Clicking on this icon will cause the ABC Config Tool to disconnect from the gateway.

- **Start Logging & Stop Logging**
  See 3-16 "Tools" & "Data Logger" on page 35.

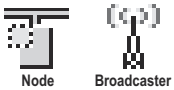



- **Subnetwork Monitor**
  Clicking on this icon will launch the Subnetwork Monitor (see "Subnetwork Monitor" on page 30).

- **Add Command**
  This icon is used to add commands to the currently selected node.

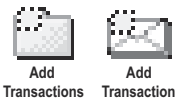
- **Add Mailbox**
  (Advanced functionality, see "Mailbox Editor" on page 42)

- **Add Node & Add Broadcaster**
  These icons are used to add nodes to the configuration.




- **Node Monitor**
  Clicking on this icon will launch the Node Monitor (see "Node Monitor" on page 31)

- **Add Transaction(s)**
  These icons are used to add transactions to the currently selected node.



# 4. Basic Settings

## 4.1 Fieldbus Settings

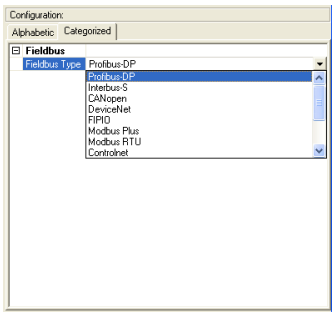
(Select 'Fieldbus' in the Navigation Section to gain access to the parameters described in this section).

### General

During start-up the fieldbus interface of the gateway is initialized to fit the configuration created in the ABC Config Tool. Optionally, some initialisation parameters can be set manually to provide better control over how the data shall be treated by the gateway.

### Fieldbus Type

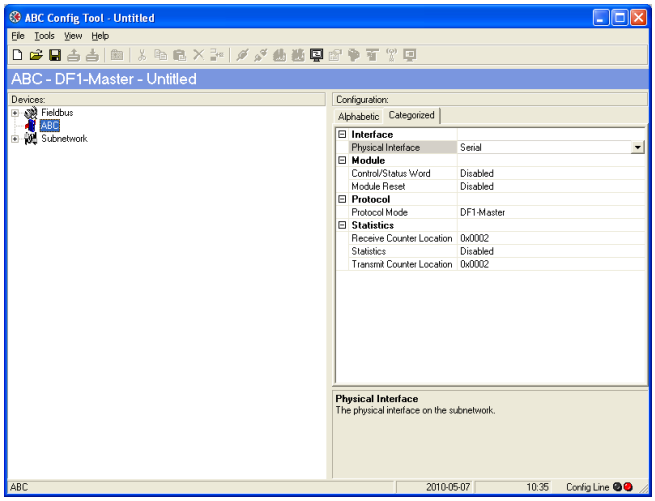
The ABC Config Tool supports a wide range of networking systems. Make sure that this parameter is set to the correct fieldbus.




**Fieldbus Type**

# 4.2 ABC Parameters

(Select 'ABC' in the Navigation Section to gain access to the parameters described in this section).




### Interface

Currently, only serial communications is supported.

### Status / Control Word

(See "Control and Status Registers" on page 37).

| Value | Description |
|---|---|
| Enabled | Enable the Control- and Status Registers. The 'Data Valid'-bit in the Control Register must be set to start the subnetwork communication. |
| Enabled but no startup lock | This setting is similar to 'Enabled', except that the control system is not required to set the 'Data Valid'-bit to start the subnetwork communication. |
| Disabled | This setting completely disables the Control- and Status Registers. |

### Module Reset

This parameter specifies how the gateway will behave in the event of a fatal error.

| Value | Description |
|---|---|
| Enabled | The gateway will be restarted, and no error will be indicated to the user. |
| Disabled | The gateway will halt and indicate an error. |

### Protocol Mode

This parameter specifies which protocol mode to use for the subnetwork.

| Value | Description |
|---|---|
| Generic Data Mode | These modes are not described in this document. Please refer to the respective ABC fieldbus manuals. |
| Master Mode | |
| DF1 | This mode is intended for the DF1 protocol. The ABC can only be configured as a Master with half-duplex communication.<br>**Note:** This is the only mode available if you intend to configure an ABC module for DF1. |

See also "Protocol Modes" on page 12.

### Statistics

The Transmit- and Receive Counters indicate how many transactions that have successfully been exchanged on the subnetwork. This feature is primarily intended for debugging purposes.

- **Receive Counter Location**

  Specifies the location of the Receive Counter in the internal memory buffer.

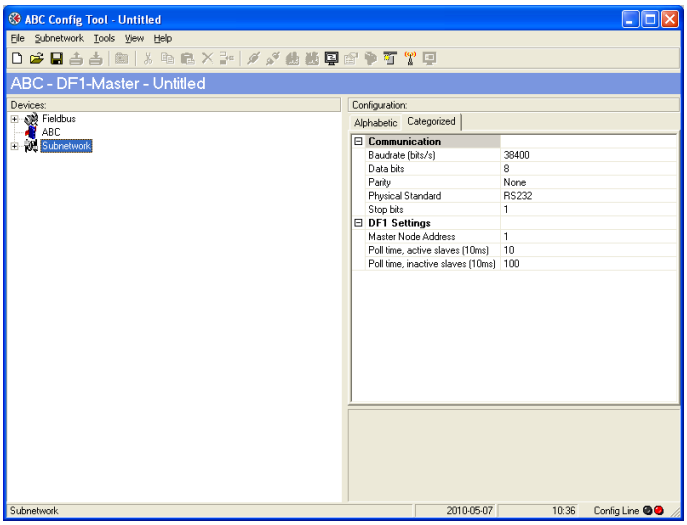
- **Transmit Counter Location**

  Specifies the location of the Transmit Counter in the internal memory buffer.

Both counters are enabled by setting 'Statistics' to 'Enabled'.

# 4.3 Subnetwork Parameters

To gain access to the parameters described in this section, select 'Subnetwork' in the Navigation Section. DF1 has to be selected as protocol mode for the below to be valid, see "Protocol Mode" on page 21.




## Communication

These parameters specify the actual communication settings used for the subnetwork.

| Parameter | Description | Valid Settings |
|---|---|---|
| Baud rate | Selects the bit rate | 2400<br>4800<br>9600<br>19200<br>38400 (Default) |
| Data bits | Selects the number of data bits | 8 |
| Parity | Selects the parity mode | None<br>Odd<br>Even |
| Physical standard | Selects the physical interface type | RS232<br>RS422<br>RS485 |
| Stop bits | Number of stop bits. | 1 |

## DF1 Settings

| Parameter | Description |
|---|---|
| Master Node Address | Node address of the master, valid values: 0-254, default 1 |
| Poll time, active slaves (10 ms) | Determines how often the slave shall be polled in steps of 10 ms, default 100 ms[a] |
| Poll time, inactive slaves (10 ms) | Determines how often the slave shall be polled in steps of 10 ms, default 1000 ms[b] |

a. The default value is given as 10 in the parameter window. Each change of 10 ms either increases or decreases this value by 1, i.e. 9 represents a poll time of 90 ms and 11 represents a poll time of 110 ms.

b. The default value is given as 100 in the parameter window. Each change of 10 ms either increases or decreases this value by 1, i.e. 99 represents a poll time of 990 ms and 101 represents a poll time of 1010 ms.

# 5. Nodes

## 5.1 General

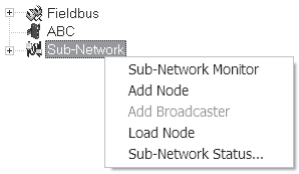
In ABC Config Tool, a node represents a single device on the network. While the gateway doesn't feature a scanlist in the traditional sense, all nodes, and their transactions, will be processed in the order they have been defined in the ABC Config Tool.

The maximum number of nodes that can be created in the ABC Config Tool is 50.

## 5.2 Adding & Managing Nodes

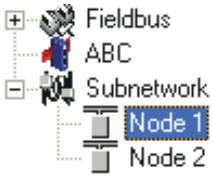
(Right-click on 'Subnetwork' in the Navigation Section to gain access to these functions)

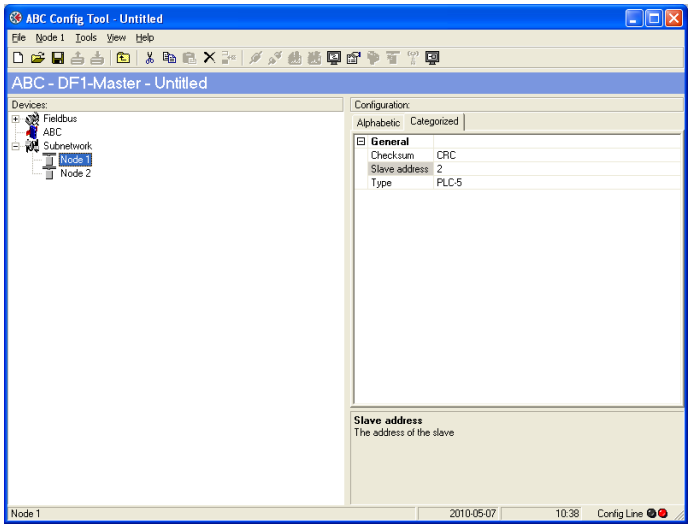
| Function | Description |
|---|---|
| Paste | Paste a node from the clipboard |
| Subnetwork Monitor | Launch the subnet monitor ( "Subnetwork Monitor" on page 30) |
| Add Node | Add a node to the configuration |
| Add Broadcaster | (not available in DF-1 master mode) |
| Load Node | Add a previously saved node |
| Subnetwork Status... | View diagnostic information about the subnetwork |



# 5.3 Node Parameters

To gain access to the parameters described in this section, select a node in the Navigation Section.




| Parameter | Description | Valid Settings |
|---|---|---|
| Checksum | Selects the type of checksum on the network. | BCC<br>CRC (default) |
| Slave Address | The value entered here sets the node address. | 0-254 |
| Type | The PLC type of the slave | PLC-5<br>SLC500<br>MicroLogix |

# 6. Master to Slave Communication

## 6.1 General

The communication between master and slave in the DF1 subnetwork is performed using services. These are pre-defined transactions that can be stored and reused. The user configures each slave with services that can be issued from the master. A total of 50 services are allowed.

The ABC-DF1 module supports  a selection of DF1 commands, and when the ABC-DF1 module is going to execute a service, it automatically chooses the approprioate DF1 command(s) that are used to perform the service on the selected DF1 node type.

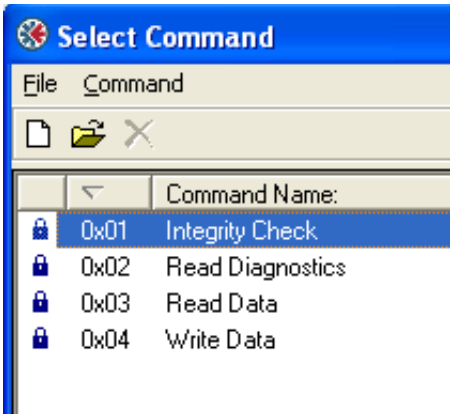
## 6.2 Services

Right click on the node, and choose Add Command. A pop-up window will show with the four different services that are available:.

- Integrity check
- Read diagnostic
- Read data
- Write data

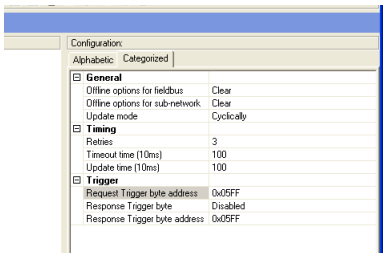
A maximum of  50 services in total (for all nodes) can be selected.

The pre-defined services can be configured to suit the application. Select a service to show the parameters.



### 6.2.1 General Configuration Parameters

These parameters are common to all services, but the settings are individual to each instance of a service.




#### General:

| Parameter | Description | Valid settings |
|---|---|---|
| Offline options for fieldbus | The action to take for this service if the fieldbus goes offline. This option affects the data that is sent out to the subnetwork. | Clear<br>Freeze<br>Noscanning |
| Offline options for subnetwork | The action to take for this service if the subnetwork goes offline. This option affects the data that is reported to the fieldbus master. | Clear<br>Freeze |
| Update mode | The update mode for the service | Cyclically<br>On data change<br>Single shot<br>Change of state on trigger |

#### Timing:

| Parameter | Description | Default |
|---|---|---|
| Retries | The number of times to resend this service before the node is disconnected | 3 |
| Timeout time (10 ms) | The time to wait before resending this service (in steps of 10 ms)[a] | 1000 ms |
| Update time (10 ms) | The minimum time between two services of this kind (in steps of 10 ms)[a] | 1000 ms |

a. The default value is given as 100 in the parameter window. Each change of 10 ms either increases or decreases this value by 1, i.e. 99 represents a poll time of 990 ms and 101 represents a poll time of 1010 ms.

#### Trigger:

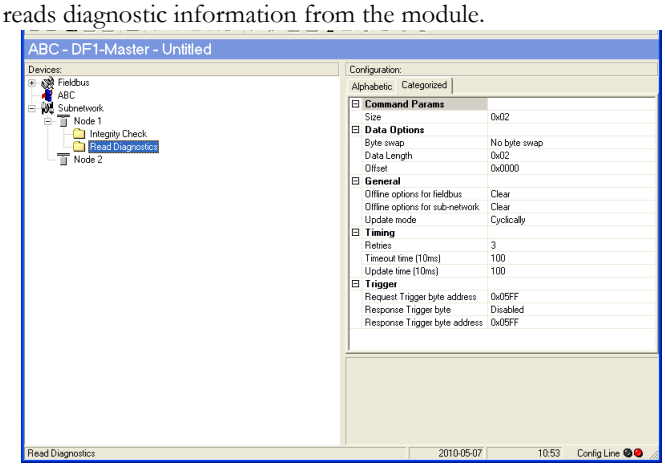
| Parameter | Description | Default |
|---|---|---|
| Request Trigger byte address | The memory location of the trigger byte this service uses for updates on trigger byte changes | 0x05FF |
| Response Trigger byte | Enables/disables the trigger byte | Disabled |
| Response Trigger byte address | The memory location of the trigger byte this service uses for updates on trigger byte changes | 0x05FF |

## 6.3 Integrity Check

This service checks that a node is up and running correctly. A telegram is sent to the node. The node mirrors and returns the telegram. No configuration is needed, apart from the general parameters, common to all services.

# 6.4 Read Diagnostics

This service reads diagnostic information from the module.




### Command Params

The command parameter Size decides how large amount of data can be read. The size is given in bytes which means that it always has to be an even number as only whole elements can be read from the slave. One bit/integer element is 2 bytes and one float element is 4 bytes. The range of the size differs, depending on node type:

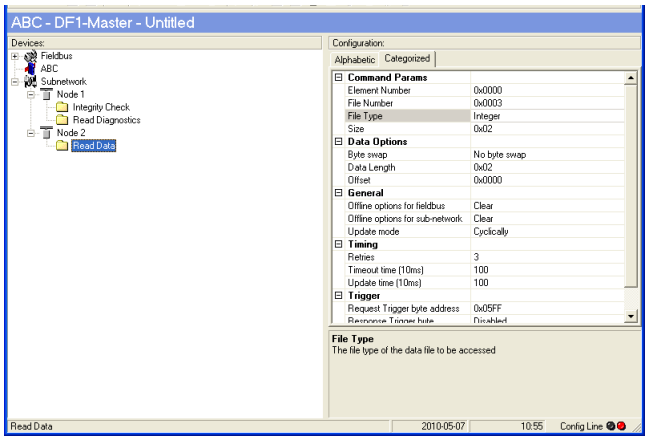
| | PLC-5 | SLC500 | MigroLogix |
|---|---|---|---|
| **Size range (in bytes)** | 1-26 | 1-28 | 1-26 |

### Data options:

| Parameter | Description | Valid settings |
|---|---|---|
| Byte swap | Determines if the data shall be swapped | No byte swap<br>Swap words<br>Swap double words |
| Data length | The number of bytes, read from the DF1 network, to write to the area determined by the Offset parameter | ≤ Size |
| Offset | The offset in the internal memory buffer in the ABC module, where the data shall be read. See “Memory Map” on page 10.<br>**Note**: If the control and status registers are enabled (default), first available data location will be: Input Area 0x002, Output Area 0x202. | - |

# 6.5 Read Data

This service is used to read data from the nodes in the subnetwork.




### Command Params

| Parameter | Description | Valid settings |
|---|---|---|
| Element Number | The element number of the data file to be accessed within the slave. | PLC-5: 0-999<br>SLC500: 0-255<br>MicroLogix: 0-255 |
| File Number | The file number of the data file to be accessed | PLC-5: 3, 7, 8, 10-999<br>SLC500: 3, 7, 8, 10-255<br>MicroLogix: 3, 7, 8, 10-255 |
| File Type | The file type of the data to be accessed. | Integer<br>Bit<br>Float |
| Size | The number of bytes to read from the slave. One bit/integer element is 2 bytes and one float element is 4 bytes. The parameter must have an even value as only whole elements can be read from the slave. | PLC-5: 2-240<br>SLC500: 2-236<br>MicroLogix: 2-242 |

### Data Options

| Parameter | Description | Valid settings |
|---|---|---|
| Byte swap | Determines if the data shall be swapped | No byte swap<br>Swap words<br>Swap double words |
| Data length | The number of bytes, read from the DF1 network, to write to the area determined by the Offset parameter | ≤ Size |
| Offset | The offset in the internal memory buffer in the ABC module, where the data shall be read. See “Memory Map” on page 10.<br>**Note**: If the control and status registers are enabled (default), first available data location will be: Input Area 0x002, Output Area 0x202. | - |

# 6.6 Write Data

This service is used to write data to the nodes in the subnetwork. The parameters to be configured are the same as for the service Read Data. The only difference is that data is read from the internal memory buffer in the ABC module and written to the subnetwork bus , instead of written to the internal memory buffer.

# 7. Subnetwork Monitor

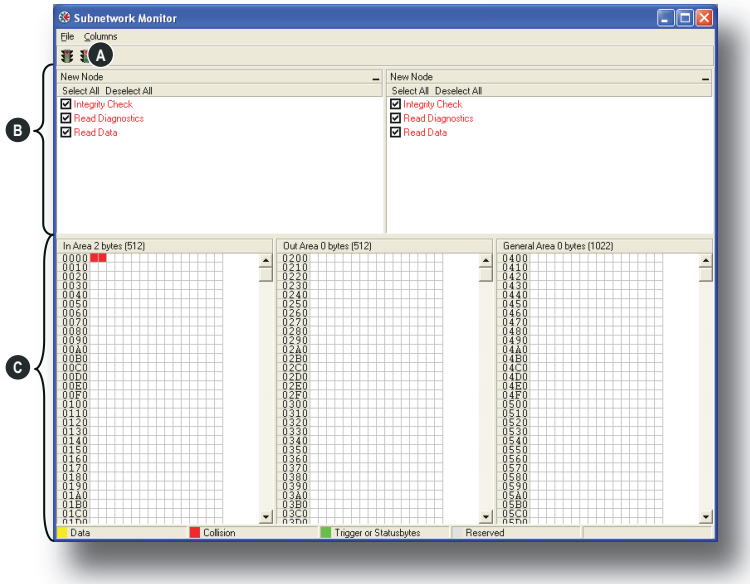
## General

The Subnetwork Monitor is intended to simplify configuration and troubleshooting of the subnetwork. It's main function is to display the data allocated for subnetwork communication and detect if any area has been allocated twice (i.e if a collision has occurred).

All configured nodes, and their transactions, are listed in the middle of the screen (B). Selecting and de-selecting single transactions makes it possible to view any combination of allocated data.

**Note:** The subnetwork monitor has a negative influence on the overall performance of the gateway. Therefore the monitor functionality should be used with care.

## Operation




### A: Start Network & Stop Network Icons

These icons controls the subnetwork activity. To stop all subnetwork activity, click on the red light. To start the subnetwork again, click on the green light.

Start

Stop

### B: Nodes / Services

To view data blocks associated with a service, select the service in the list. The corresponding data will then appear in the Monitor Section (C).

### C: Monitor Section

This section visualises how data is allocated in the Input, Output and General Data areas.

| Colour | Meaning |
|---|---|
| White | Not allocated. |
| Yellow | Data allocated by a Read or Write transaction. |
| Red | Collision; area has been allocated more than once. |
| Grey | Reserved (illustrates memory consumption, area can be allocated if necessary) |
| Green | Data allocated by Trigger byte or Control/Status Registers. |

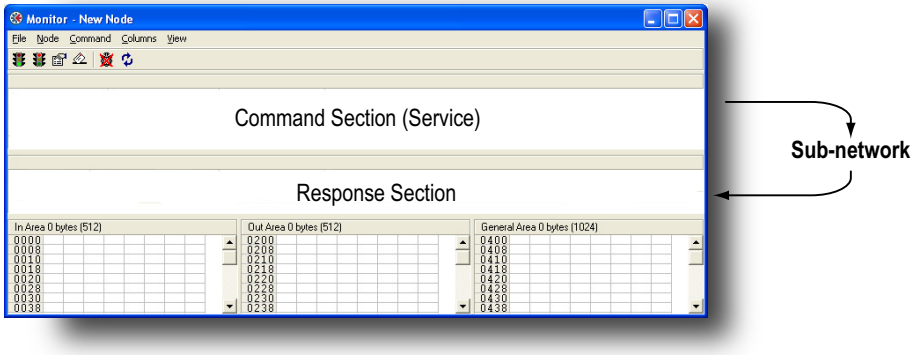
# 8. Node Monitor

## 8.1 General

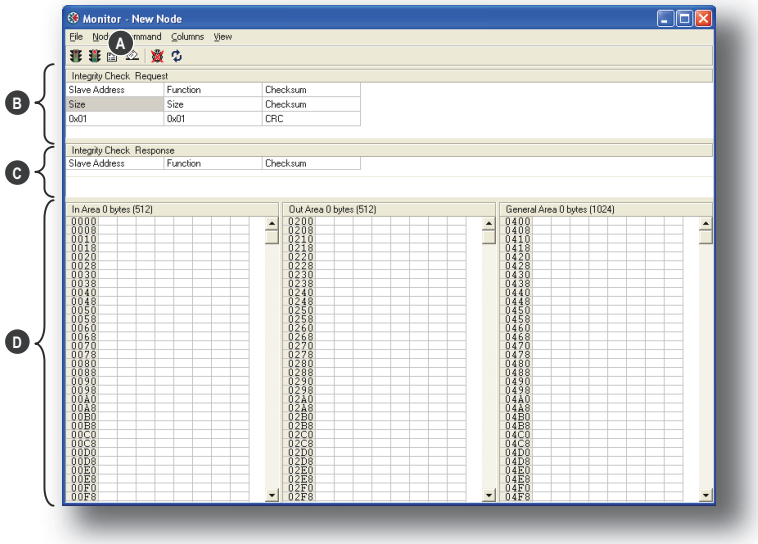
The Node Monitor can provide valuable information when setting up the communication with the subnetwork, by allowing individual commands to be issued manually, and monitoring the response (if applicable). It also provides an overview of the memory used by a particular node.

**Note:** The node monitor has a negative influence on the overall performance of the gateway, i.e. it should be used only when necessary.

The selected Command (Service) is sent to the subnetwork. The response to the Service can be monitored in the Response Section.



# 8.2 Navigating the Node Monitor




**A: Pull-down Menu & Toolbar Icons**

See 8-33 “Pull-Down Menu” and 8-34 “Toolbar Icons”

**B: Command Section**

This section holds the currently selected service. The individual frame objects in the command can be edited in a similar way as in the Transaction- and Command Editors.

**C: Response Section**

This section holds the response to the selected service.

**D: Monitor Section**

This section displays the data associated with the node. Areas in dark grey are reserved for the Status & Control Registers, and areas displayed in light grey represents the data that is used by the node.

The data displayed in this section will be refreshed based on the refresh-icons in the toolbar. For more information, see 8-34 “Toolbar Icons”

## 8.2.1 Pull-Down Menu

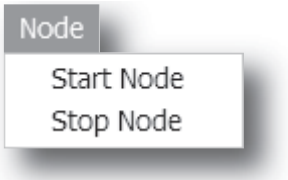
### File

There is only one entry in this menu:

- **Exit**
  This will close the Node Monitor. Note however that if the node has been disabled using 'Stop Node' (see below), it will not resume data exchange until enabled again using 'Start node'.

### Node

This menu controls the data exchange for the node. This feature can help isolate problems associated with a particular node.

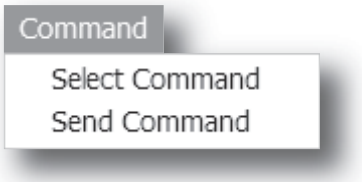



- **Start Node**
  Enable the transactions associated with the node.
- **Stop Node**
  Disable the transactions associated with the node.

### Command

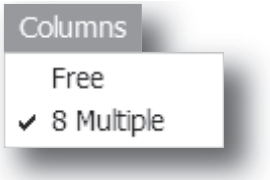
This menu is used to specify and issue a command manually.

- **Select Command**
  Select a command to be sent on the subnetwork.
- **Send Command**
  Send the specified command to the subnetwork.




### Columns

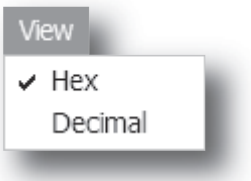
This menu specifies the number of columns in the Monitor Section.




- **Free**
  The number of columns depends on the width of the window.
- **8 Multiple**
  The number of columns will be fixed to 8.

### View

This menu specifies the data representation in the Monitor Section.




- **Hex**
  Display the data in hexadecimal format.
- **Decimal**
  Display the data in decimal format.

## 8.2.2 Toolbar Icons

The toolbar features icons for the most commonly used functions.

- **Start Node & Stop Node**
  These icons corresponds to the functions in the 'Node'-menu.
  See also 8-33 "Node".

- **Select Command & Send Command**
  These icons corresponds to the functions in the 'Command'-menu.
  See also 8-33 "Command".

- **Resume Refresh & Stop Refresh**
  When enabled, the data displayed in the Monitor Section will be refreshed cyclically. When disabled, i.e. stopped, the data will have to be refreshed manually using the 'Refresh'-icon (see below).

- **Refresh**
  When clicking on this icon, the data displayed in the Monitor Section will be refreshed.

# 9. Data Logger

## 9.1 General

This feature allows the subnetwork traffic to be logged into a buffer for examination. This may provide valuable information when debugging the lowest levels of the subnetwork communication.

Note that the logger function is part of the gateway itself and is separate from the ABC Config Tool. This means that logging can be performed even if the gateway is physically disconnected from the PC running the ABC Config Tool.

## 9.2 Operation

### Start & Stop Logging

- **Start logging**

  Select 'Start Logging' in the 'Tools'-menu. ABC Config Tool will then prompt for the desired mode of operation, see below.

- **Stop logging**

  Select 'Stop Logging' in the 'Tools'-menu. This will open the log-window, see below.

### Modes of Operation

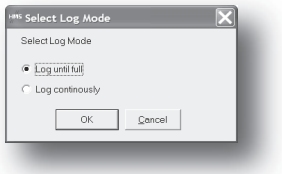
Select the desired mode of operation and click 'OK' to start logging data.

- **Log until full**

  Data will be logged until the log-buffer is full.

- **Log continuously**

  Data will be logged continuously until logging is stopped by clicking 'Stop Logging'. The log-buffer will contain the most recent data.

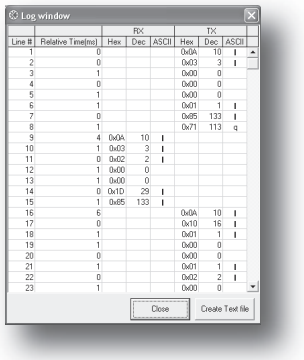



### Log Window

The logged data is displayed in Hexadecimal, Decimal and ASCII format for both directions. The time between the log-entries is displayed in a separate column.

The data may optionally be saved in ASCII text format by clicking 'Create Text file'.

Click 'Close' to exit.



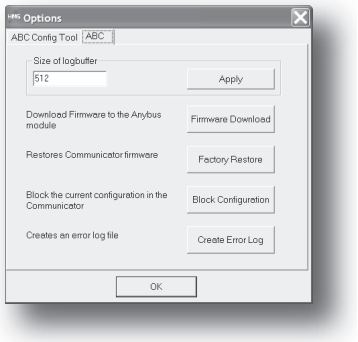
# 9.3 Configuration

By default, the log-buffer can hold 512 bytes of data in each direction. To specify a different size for the buffer, select 'Options' in the 'Tools'-menu.

A window with various settings will appear. Select the 'ABC'-tab, and enter the desired number of buffer entries under 'Size of logbuffer' (valid settings range from 1...512).

Click 'Apply' to validate the new settings.

Click 'OK' to exit.



# 10. Control and Status Registers

## 10.1 General

The Control- and Status Registers are disabled by default, but can be enabled using the ABC Config Tool (see 4-20 "Status / Control Word"). These registers form an interface for exchanging status information between the subnetwork and the fieldbus control system.

The main purpose of these registers is to...

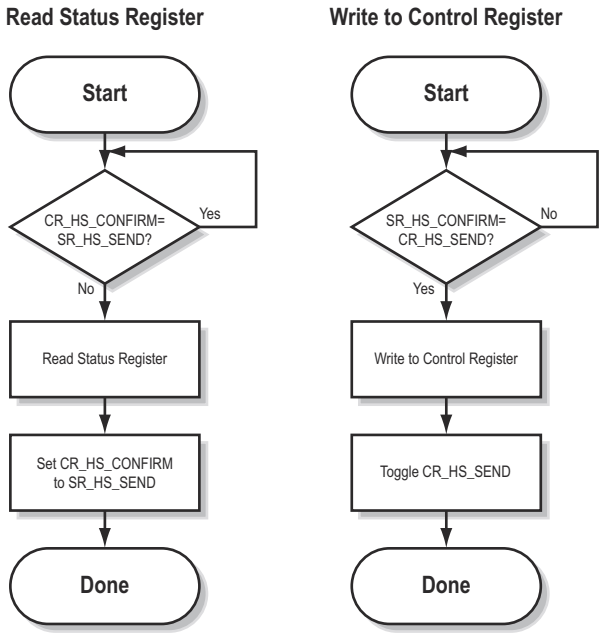
- Report subnetwork related problems to the fieldbus control system
- Ensure that only valid data is exchanged in both directions
- Enable the fieldbus control system to start/stop data exchange with selected nodes on the subnetwork

If enabled, these registers occupy the first two bytes in the Input- and Output Data areas (0x000-0x001 and 0x200-0x201 respectively), which means they can be accessed from the fieldbus just like any other data in these areas.

**Note:** Internally, these registerse are stored in Motorola-format (i.e. MSB first). If the higher level network uses a different byte order, the upper and lower bytes will appear swapped.

### 10.1.1 Handshaking Procedure

A special handshaking procedure, which is illustrated in the two flowcharts below, must be followed when accessing these registers to ensure that both parts receive proper information.



## 10.1.2 Data Consistency

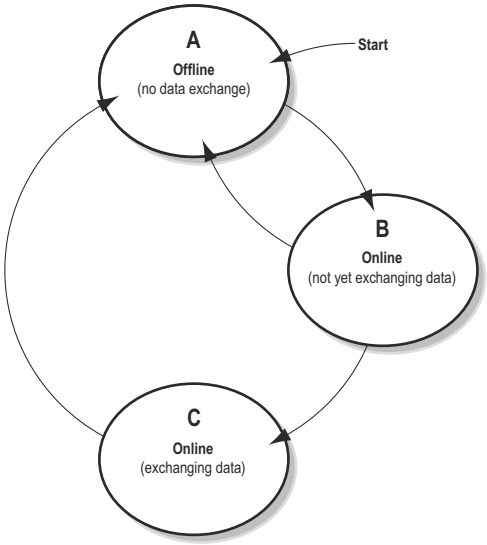
The 'Data Valid'-bits in the Control- and Status Registers are used to ensure data consistency during start-up and fieldbus off-line/on-line transitions.

If the 'Status / Control Word'-parameter in ABC Config Tool is set to 'Enabled', the gateway will wait for the fieldbus control system to set the 'Data Valid'-bit in the Control Register before it starts exchanging data on the subnetwork.

If the same parameter is set to 'Disabled' or 'Enabled but no startup lock', communication will start as soon as the fieldbus goes online.

### State Machine

The fieldbus network participation can be described using a state machine as described below.




**A: Offline (No data exchange)**

1. Clear the 'Data Valid'-bit in the Control Register.
2. Write initial data to the Output Area according to the subnetwork configuration.
3. Wait until the fieldbus control system and the gateway are online on the fieldbus network, and shift to state B.

**B: Online (Not yet exchanging data)**

4. Wait until the 'Data Valid'-bit in the Status Register is cleared by the gateway.
5. Set the 'Data Valid'-bit in the Control Register.
6. When the 'Data Valid'-bit in the Status Register is set by the gateway, shift to state C.
7. If the gateway goes offline on the fieldbus, shift to state A.

**C: Online (Exchanging data)**

Exchanging valid data in both directions.
If the gateway goes offline on the fieldbus, shift to state A.

**Note:** The gateway cannot spontaneously clear the 'Data Valid'-bit in the Status Register.

### Latency

The 'Data Valid'-bit in the Status Register may in some cases be delayed. This latency can be caused by a missing node or a bad connection to a node with a long timeout value assigned to it.

Therefore, the fieldbus control system should not wait for this bit to be set before communicating with the subnetwork devices; it should be considered as an aid for the fieldbus control system to know when all data has been updated.

# 10.2 Status Register Contents (Gateway to Control System)

## 10.2.1 General Information

The Status Register is (if enabled) located at 0x000-0x001 and constitues a bit-field as follows

| bit(s) | Name | Description |
|---|---|---|
| 15 | Send (SR_HS_SEND) | These bits control the handshaking towards the fieldbus control system.<br><br>See also...<br>- 10-38 “Handshaking Procedure”<br>- 10-41 “Control Register Contents (Control System to Gateway)” |
| 14 | Confirm (SR_HS_CONFIRM) | |
| 13 | Data Valid (Master Mode Only) | This bit is set when all transactions have been executed successfully at least once. Once set, it will not change.<br>1:Data Valid<br>0:Data not Valid |
| 12... 8 | Status Code | This field holds the last status report from the gateway.<br><br>See also...<br>- 10-40 “Status Codes in DF1 Master Mode”<br>- 10-40 “Note: Conditions of type ‘Error’ will eventually be followed by a ‘No Error’ condition when the cause has been resolved. Conditions of type ‘Warning’ are however considered informational and may not necessariy be followed by a ‘No Error’ condition later on.” |
| 7... 0 | Data | |

**Note:** Internally, this is treated as a Motorola-format word (i.e. MSB first). If the higher level network uses a different byte order, the upper and lower bytes will appear swapped.

## 10.2.2 Status Codes in DF1 Master Mode

| Code | Condition | Type | Data | Description |
|---|---|---|---|---|
| 0x00 | Re-transmission Counter Updated | Warning | Counter | The number of re-transmissions on the sub-network has increased. If this problem persists, this may eventually trigger a Single- or Multiple Node(s) Missing condition. |
| 0x01 | Single Node Missing | Error | Slave address | A single node is missing. |
| 0x02 | Multiple Nodes Missing | Error | Number of nodes | Multiple nodes are missing. |
| 0x03 | Buffer Overrun | Warning | Slave address | A node returned more data than expected. |
| 0x04 | Other Error | Error | Slave address | Undefined error |
| 0x1F | No Error | Warning | - | No errors |

**Note:** Conditions of type ‘Error’ will eventually be followed by a ‘No Error’ condition when the cause has been resolved. Conditions of type ‘Warning’ are however considered informational and may not necessariy be followed by a ‘No Error’ condition later on.

# 10.3 Control Register Contents (Control System to Gateway)

## 10.3.1 General Information

The Control Register is (if enabled) located at 0x200-0x201 and constitues a bit-field as follows:

| bit(s) | Name | Description |
|---|---|---|
| 15 | Confirm (CR_HS_CONFIRM) | These bits control the handshaking towards the gateway.<br><br>See also...<br>- 10-38 “Handshaking Procedure”<br>- 10-40 “Status Register Contents (Gateway to Control System)” |
| 14 | Send (CR_HS_SEND) | |
| 13 | Data Valid | This bit controls data consistency (see 10-39 “Data Consistency”).<br>1:Output Area valid; exchange data on the subnetwork<br>0:Output Area not valid; do not exchange data on the subnetwork<br>**Note:** This bit is only relevant if the Control/Status Registers are set as ‘Enabled’ |
| 12 | Execute Command | If set, the specified command will be executed by the gateway (see below). |
| 11... 8 | Control Code | This field holds commands which can be executed by the gateway (see below).<br><br>See also...<br>- 10-41 “Control Codes in DF1 Master Mode.” |
| 7... 0 | Data | |

**Note:** Internally, this is treated as a Motorola-format word (i.e. MSB first). If the higher level network uses a different byte order, the upper and lower bytes will appear to be swapped.

## 10.3.2 Control Codes in DF1 Master Mode.

| Code | Instruction | Data | Description |
|---|---|---|---|
| 0x00 | Disable Node | Actual node address | Disables the specified node. |
| 0x01 | Enable Node | Actual node address | Enables a previously disabled node. |
| 0x02 | Enable Nodes | Actual number of nodes to enable | Enables the specified number of nodes, starting from the first node in the configuration. Remaining nodes will be disabled. |

# 11. Advanced Fieldbus Configuration

## 11.1 General

The fieldbus interface of the gateway consists of an embedded Anybus-S communication interface. Normally, the Anybus-S configuration settings are set up automatically by the gateway. However, advanced users can configure the Anybus-S card for specific features. This chapter assumes that the reader is familiar with the Anybus-S and it's application interface. For more information about the Anybus-S platform, consult the Anybus-S Parallel Design Guide.

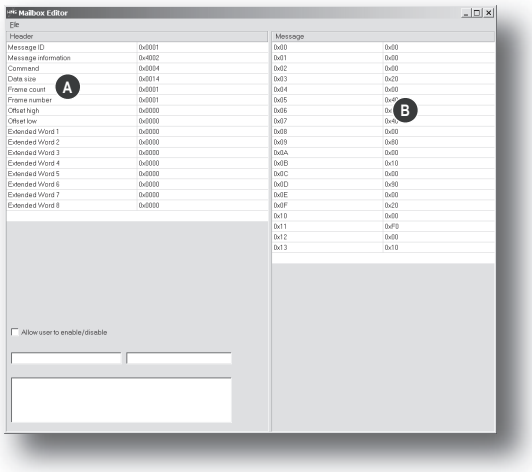
The standard initialisation parameters are determined by the subnetwork configuration. Information about the amount of input- and output data used for subnetwork communication is used by ABC Config Tool to create the configuration message that sets the sizes of the input- and output data areas in the Dual Port RAM of the embedded Anybus-S interface. It is possible to add fieldbus specific mailbox messages to customize the initialisation. This is done in the Mailbox Editor, see below.

(A mailbox message is a HMS specific command structure used for low-level communication with an Anybus-S interface. Consult the Anybus-S Parallel Design Guide and the fieldbus appendix for the desired fieldbus for further information.)

## 11.2 Mailbox Editor

To add a mailbox message to the configuration, right-click on 'EndInit' and select 'Insert New Mailbox'.

A mailbox message consists of a Header section and a data section where the Header consists of 16 words (32 bytes) and the data section consists of up to 128 words (256 bytes). All fields are editable except the Message information field that is fixed to 0x4002, which means that only fieldbus specific mailbox messages can be entered here.




The mailbox message is presented as two columns; one contains header information (A), the other one contains the message data (B).

To add message data, simply change the Data size parameter in the header column (A), and the corresponding number of bytes will appear in the message data column (B).

For more information about fieldbus specific mailbox messages, consult the separate Anybus-S Fieldbus Appendix for the fieldbus you are using. For general information about the Anybus-S platform, consult the Anybus-S Design Guide.

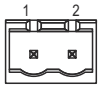
# A. Connector Pin Assignments

## A.1 Fieldbus Connector

Please refer to the ABC manual for the fieldbus that will be used.. All manuals are available for download at www.anybus.com.

## A.2 Power Connector

| Pin | Description |
|---|---|
| 1 | +24V DC |
| 2 | GND |

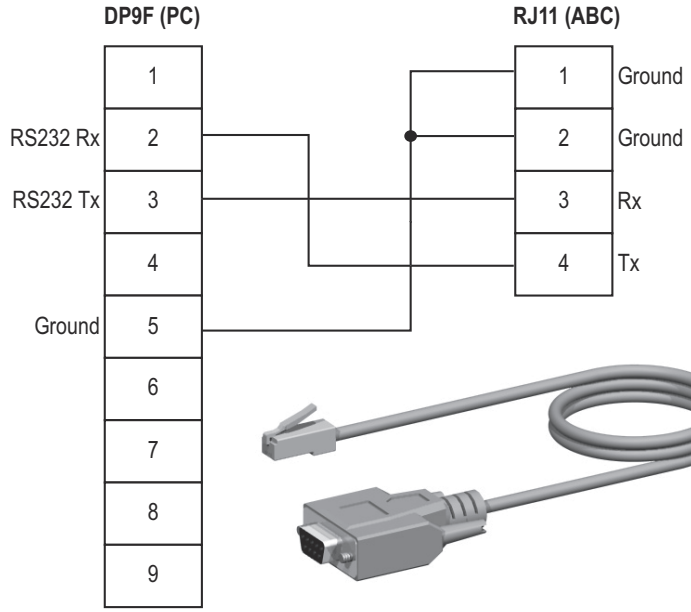



**Notes:**

- Use 60/75 or 75×C copper (CU) wire only.
- The terminal tightening torque must be between 5... 7 lbs-in (0.5... 0.8 Nm)

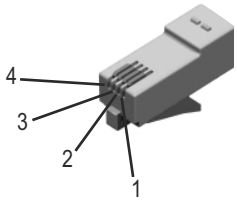
# A.3 PC Connector

### Configuration Cable Wiring



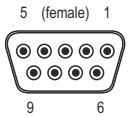

### RJ9 (ABC)

| Pin | Description |
|---|---|
| 1 | Signal ground |
| 2 | |
| 3 | RS232 Rx (Input) |
| 4 | RS232 Tx (Output) |




### DB9F (PC)

| Pin | Description |
|---|---|
| 1 | - |
| 2 | RS232 Rx (Input) |
| 3 | RS232 Tx (Output) |
| 4 | - |
| 5 | Signal Ground |
| 6 - 9 | - |



# A.4 Subnetwork Interface

## A.4.1 General Information

The subnetwork interface provides for RS232, RS422 and RS485 communications. Depending on the configuration specified in the ABC Config Tool, different signals are activated in the subnetwork connector.

## A.4.2 Bias Resistors (RS485 Only)

When idle, RS485 enters an indeterminate state, which may cause the serial receivers to pick up noise from the serial lines and interpret this as data. To prevent this, the serial lines should be forced into a known state using pull-up and pull-down resistors, commonly known as bias resistors.

The bias resistors forms a voltage divider, forcing the voltage between the differential pair to be higher then the threshold for the serial receivers, typically >200mV.

Note that bias resistors shall only be installed on one node; installing bias resistors on several nodes may compromise the signal quality on the network and cause transmission problems.

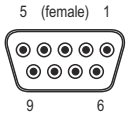
## A.4.3 Termination (RS485 & RS422 Only)

To avoid reflections on the serial lines, it is important to properly terminate the subnetwork by placing termination resistors between the serial receivers near the end nodes.

The resistor value should ideally match the characteristic impedance of the cable, typically 100... 120R.

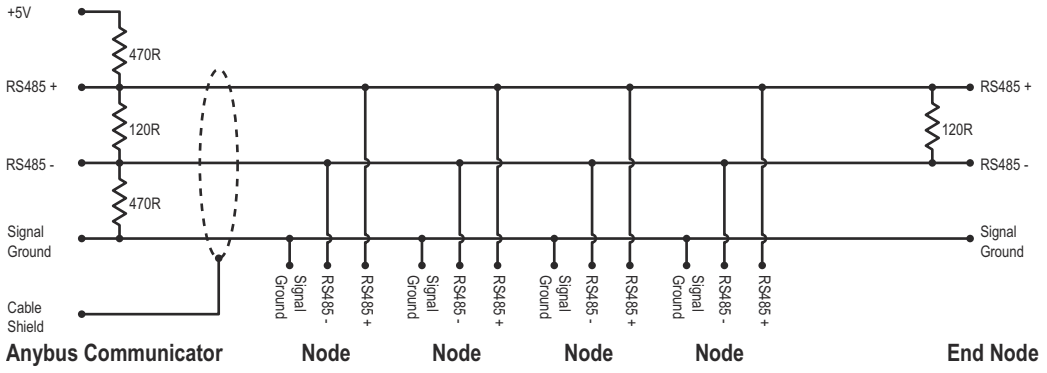
## A.4.4 Connector Pinout (DB9F)

| Pin | Description | RS232 | RS422 | RS485 |
|---|---|---|---|---|
| 1 | +5V Output(100mA max) | ✓ | ✓ | ✓ |
| 2 | RS232 Rx | ✓ | | |
| 3 | RS232 Tx | ✓ | | |
| 4 | (reserved) | | | |
| 5 | Signal Ground[a] | ✓ | ✓ | ✓ |
| 6 | RS422 Rx + | | ✓ | |
| 7 | RS422 Rx - | | ✓ | |
| 8 | RS485 + /RS422 Tx+ | | ✓ | ✓ |
| 9 | RS485 - /RS422 Tx- | | ✓ | ✓ |
| (housing) | Cable Shield | ✓ | ✓ | ✓ |

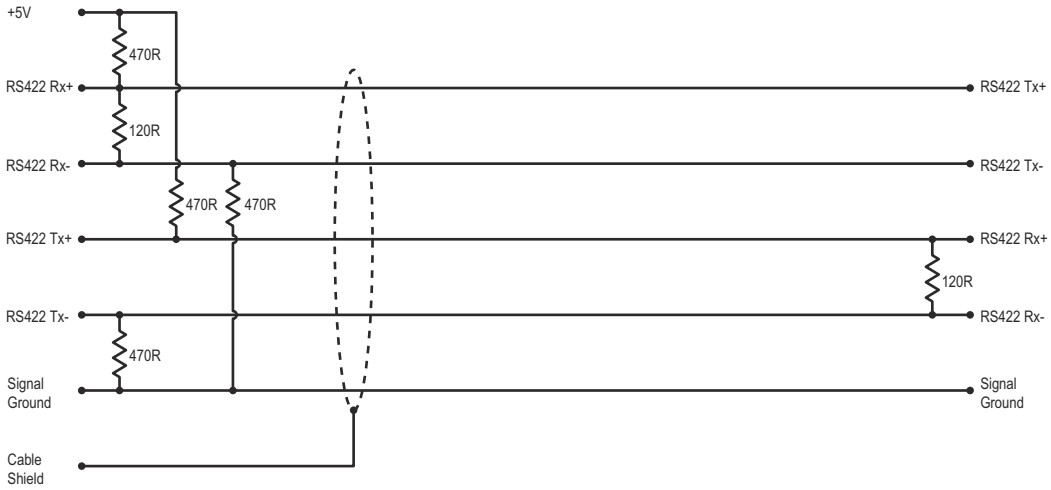



a. Connecting this signal directly Protective Earth (PE) of other nodes may, in case of grounding loops etc., cause damage to the on-board serial transceivers. It is therefore generally recommended to connect it only to Signal Ground (if available) of other nodes.

## A.4.5 Typical Connection (RS485)

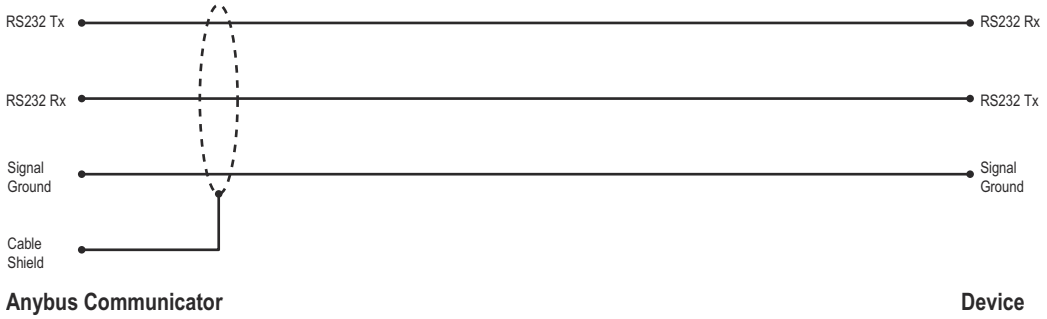



## A.4.6 Typical Connection (RS422 & 4-Wire RS485)




**Note:** Bias resistors are normally not needed on RS422, but may be required when using 4-wire RS485.

## A.4.7 Typical Connection (RS232)



# B. Technical Specification

## B.1 Mechanical Properties

### Housing

Plastic housing with snap-on connection to DIN-rail, protection class IP20

### Dimensions

120 mm x 75 mm x 27 mm, L x W x H (inches: 4.72" x 2.95" x 1.06"; L x W x H)

## B.2 Electrical Characteristics

### Power Supply

Power: 24V ± 10%

### Power Consumption

Please refer to the respective ABC fieldbus manuals.

## B.3 Environmental Characteristics

### Relative Humidity

The product is designed for a relative humidity of 0 to 95% non-condensing

### Temperature

| | |
|---|---|
| Operating: | ±0°C to +55°C |
| Non Operating: | -25°C to +85°C |

# B.4 Regulatory Compliance

### EMC Compliance (CE)

This product is in accordance with the EMC directive 2004/108/EC through conformance with the following standards:

- **EN 61000-6-4 (2007)**
  EN 55016-2-3, Class A (2006)

- **EN 61000-6-2 (2005)**
  EN 61000-4-2 (2009)
  EN 61000-4-3 (2006)
  EN 61000-4-4 (2004)
  EN 61000-4-5 (2005)
  EN 61000-4-6 (2007)

### UL/c-UL compliance

The certification has been documented by UL in file E214107.

### Galvanic isolation on subnetwork interface

- **EN 60950-1 (2001)**
  Pollution Degree 2
  Material Group IIIb
  250 $V_{RMS}$ or 250 VDCWorking voltage
  500 VSecondary circuit transient rating

# C. Troubleshooting

| Problem | Solution |
|---|---|
| Problem during configuration Upload / Download.<br>The Config Line “led” turns red in the ABC Config Tool. | • Serial communication failed. Try again |
| The serial port seems to be available, but it is not possible to connect to the gateway | • The serial port may be in use by another application.<br>Exit the ABC Config Tool and close all other applications including the ones in the system tray.<br>Try again<br>• Select another serial port<br>Try again |
| Poor performance | • Right click ‘Sub-Network’ in the Navigation window and select ‘Sub-Network Status’ to see status / diagnostic information about the subnetwork.<br>If the gateway reports very many re-transmissions, check your cabling and / or try a lower baud rate setting for the subnetwork (if possible).<br>• Is the Sub-Net Monitor in the ABC Config Tool active?<br>The subnetwork monitor has a negative influence on the overall performance of the gateway, and should only be used when necessary.<br>• Is the Node Monitor in the ABC Config Tool active?<br>The node monitor has a negative influence on the overall performance of the gateway, and should only be used when necessary. |
| No subnetwork functionality | • Use the ‘Data logger’-functionality to record the serial data communication on the subnetwork.<br>• If no data is being transmitted, check the configuration in ABC Config Tool.<br>• If no data is received, check the subnetwork cables. Also verify that the transmitted data is correct. |

# D. ASCII Table

| | x0 | x1 | x2 | x3 | x4 | x5 | x6 | x7 | x8 | x9 | xA | xB | xC | xD | xE | xF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0x | NUL 0 | SOH 1 | STX 2 | ETX 3 | EOT 4 | ENQ 5 | ACK 6 | BEL 7 | BS 8 | HT 9 | LF 10 | VT 11 | FF 12 | CR 13 | SO 14 | SI 15 |
| 1x | DLE 16 | DC1 17 | DC2 18 | DC3 19 | DC4 20 | NAK 21 | SYN 22 | ETB 23 | CAN 24 | EM 25 | SUB 26 | ESC 27 | FS 28 | GS 29 | RS 30 | US 31 |
| 2x | (sp) 32 | ! 33 | " 34 | # 35 | $ 36 | % 37 | & 38 | ' 39 | ( 40 | ) 41 | * 42 | + 43 | , 44 | - 45 | . 46 | / 47 |
| 3x | 0 48 | 1 49 | 2 50 | 3 51 | 4 52 | 5 53 | 6 54 | 7 55 | 8 56 | 9 57 | : 58 | ; 59 | < 60 | = 61 | > 62 | ? 63 |
| 4x | @ 64 | A 65 | B 66 | C 67 | D 68 | E 69 | F 70 | G 71 | H 72 | I 73 | J 74 | K 75 | L 76 | M 77 | N 78 | O 79 |
| 5x | P 80 | Q 81 | R 82 | S 83 | T 84 | U 85 | V 86 | W 87 | X 88 | Y 89 | Z 90 | [ 91 | \ 92 | ] 93 | ^ 94 | _ 95 |
| 6x | ` 96 | a 97 | b 98 | c 99 | d 100 | e 101 | f 102 | g 103 | h 104 | i 105 | j 106 | k 107 | l 108 | m 109 | n 110 | o 111 |
| 7x | p 112 | q 113 | r 114 | s 115 | t 116 | u 117 | v 118 | w 119 | x 120 | y 121 | z 122 | { 123 | \| 124 | } 125 | ~ 126 | DEL 127 |